An Interdisciplinary Analysis of Multispectral Satellite Data for Selected Cover Types in the Colorado Mountains, Using Automatic Data Processing Techniques

EREP S 398

Monthly Progress Report for August, 1974

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A. Overall Status and Progress to Date

A.1 The contract extension for $82,500 is currently being negotiated between Purdue and NASA/Houston. This extension will be to May 31, 1975 and incorporates two significant changes to the statement of work. The first change involves elimination of the Geomorphological Analysis effort and the second change reduces the number of computer hours requested from 100 hours to 50 hours. Also, numerous minor modifications were made in the statement of work.

A.2 Data from the S-192 from the SL-2 mission has been received and been reformatted at LARS. This data includes a section up-track of the San Juan Mountains Test Site. The area includes both snow and clouds, as well as other cover types, and consequently this data will be used to document the utility of the middle IR channels for spectrally differentiating snow and clouds, one of the stated objectives in the proposal.

A.3 Mission 247 data of the San Juan Test Site which was collected in August 1973 has been received at LARS, reformatted and partially analyzed. Attached to this report is a classification of the data with a description. This classification was performed to analyze the geologic alteration zones present in the area. Comparison will be made on the aircraft data and the SKYLAB MSS data to determine advantages and disadvantages of both the platforms and sensor configurations.

A.4 Digitized SKYLAB S190A color infrared photography was made available for use during this reporting period. Several errors occurred in reformatting the data because of unfamiliarity with the data by the reformatting group at LARS. During the next reporting period this data will be corrected for all reformatting errors.

Cover type maps were received from INSTAAR for the Howardsville, Little Squaw Creek and Finger Mesa quadrangles of the San Juan Mountains Test Site. The Howardsville quadrangle was mapped at a Level II and the Little Squaw Creek and Finger Mesa quadrangles were mapped at Level I. After receiving these cover type maps, an inventory was made of all the cover type maps available for analysis of the San Juan Mountains Test Site. Table I is a list of all these type maps and their condition.

After review of the digital data and the cover type maps available, intensive test site areas to be analyzed by the Ecological Inventory Project using the S-192 data will be defined in two areas, the first of which will involve a 6 or 8 quadrangle area east of Vallecito Reservoir and the Ludwig Mountain quadrangle. The second area includes the Weminuche Pass, Little Squaw Creek and Finger Mesa quadrangles around Rio Grande Reservoir. These two areas were selected because they were the only areas that were relatively cloud free, were included in the digitized data, and for which accurate, up-to-date cover type maps were available.

B. Recommendations

The SL-3 S-192 data should be sent to LARS as soon as possible so the data can be overlayed with the digitized topographic information from the defense mapping agency and also so the data can be analyzed by the LARSYS software system.

C. Expected Accomplishments

Documentation on the snow-cloud differentiation by the middle infrared channels on SKYLAB will be initiated and is currently expected to be completed by October 31, 1974.

During the next reporting period analysis will be shifting from the aircraft data to the digitized infrared photography and S-192 data from SKYLAB.

D. Significant Results

There are no author identified significant results contained within this report.

E. Summary Outlook

An interim report is currently in the planning stages to document all work accomplished before the cost extension was initiated. Sections to be covered in this report will include general accomplishments, a synopsis of the final report by INSTAAR, and a final report from the Geomorphological Analysis Section.

F. Travel Summary

There were no funds expended from this contract for travel during this reporting period.

TABLE 1

Quadrangle	Mapped Level	Planimetered Level
Vallecito Reservoir	2	1**
Ludwig Mountain	2	1
Granite Peak	2*	NA
Baldy Mountain	2*	NA
Bear Mountain	2*	NA
Devil Mountain	2*	NA
Oakbrush Ridge	2*	NA
Chris Mountain	2*	NA
Pagosa Peak	2*	NA
Pagosa Springs	2*	NA
Little Squaw Creek	1	NA
Weminuche Pass	2**	NA
Finger Mesa	1	NA
Howardsville	2	NA
Dorango East	1**	1
Hermosa	1**	1
Handies Peak	1**	1
Snowden	1**	NA
Ironton	1**	NA

* Typed using composition rather than crown dominence
** Entire quadrangle not completed
NA Not available (not done)

DESCRIPTION OF MISSION 247 ANALYSIS

By

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The primary objective of this classification was to separate areas of possible hydrothermal alteration from unaltered rock, vegetation, snow and water using scanner data and computer-aided analysis techniques.

The classification was prepared with data obtained by the NASA, 24 channel, multispectral scanner mounted on board the NC-130 aircraft. This data was part of Mission 247 flown on August 4, 1973 in conjunction with SKYLAB 3. The data quality was good for 19 of the 24 channels. Channel 6 was marginal, channels 7 and 17 were poor and channels 18 and 19 contained no data.

Representative training samples of each primary class; altered rock, unaltered rock, mixed rock and light vegetation, dark vegetation (trees), light vegetation, snow, water and deep shadow, were selected using color and color infrared photography taken simultaneously with the scanner data on Mission 247 as ground reference data. The training samples of each class were then clustered to produce the individual sub-classes within each class. Statistics of the sub-classes were then obtained and the various sub-classes compared and recombined where necessary and the best channels for overall classification were selected. The primary 9 classes were clustered into 49 sub-classes which were recombined into the final 41 sub-classes used for classification.

Since identification of the alteration was the primary objective the best combination of channels should include 6 and/or 7, orange and red, the color of the alteration. Neither of these channels were chosen on the basis of separability because their noise created a large varience in the class statistics for all classes. Even without these channels the area of most distinct alteration were classified properly though areas of less distinct alteration were confused with unaltered rock. The confused classes were designated Q. Errors of classification in the classes other than alteration appear to be due primarily to the extreme relief causing wide variation in sunlight on the slopes.

This classification will be compared to another recently completed classification of the same area which used channel 6 with noise and to another classification now being prepared using data created by ratioing channels 4, 6, 8 and 10 in pairs to produce six combinations.